1260-15

Refractory Cements

NORTON

Steel Melting Furnaces of this type are lined with Norton Magnesia Refractory Cements.

NORTON

Refractory Cements

THE control and use of heat in many industrial processes depends upon refractory materials that may be sprayed, painted, poured, trowelled, or rammed into position.

Furthermore to obtain satisfactory service from prefired refractory shapes much may depend upon the selection of suitable cements for use with the shapes.

Norton Refractory Cements have been developed to meet the most rigid requirements. Three different heat-resisting chemically inactive materials form the main constituent of these mixtures. These raw materials are electrically fused alumina, silicon carbide, and electrically fused magnesia. All three are stable, highly refractory substances of high heat conductivity. When mixed with carefully chosen bonds also having refractory properties, they provide a complete range and variety of cements which are used by mixing to a working consistency with water. Heat is required to mature the bond and develop full body strength.

IMPORTANT NOTICE

The use of sodium silicate (water glass) with cements is not recommended when they are to come in contact with resistor units in electrically heated appliances. As a surface wash it is sometimes used to toughen against rough handling. Damage to resistor elements has been traced to this practice.

Norton Alundum Cements

Alundum Cement consists essentially of electrically fused alumina mixed with a suitable ceramic bond. The various mixtures are indicated by the symbol RA used in conjunction with a particular number such as RA-162, RA-518, etc., denoting Refractory Alundum.

Muffle with Resistor Protected by Alundum Cement.

On account of the following properties these mixtures are valuable for imbedding the resistor wires in flatirons, hot plates, etc.

1. High thermal conductivity, four times that of fire clay.
2. Good electrical insulator.
3. Chemical inactivity toward different metals used as resistors throughout a wide range of temperature.

When Alundum Cement is used to insulate resistor wires the cement may be matured either by heating in a separate furnace or by placing the unit in the circuit thereby making use of the heat from the resistor for maturing the cement.

ALUNDUM Cements (fused alumina) are put to the following typical uses:

Fine grade—Insulating resistor in electrically heated devices.
Fine grade—Furnace patching.
Fine grade—Setting refractory bricks.
Fine grade—Moulding simple shapes.
Coarse grade—Tamping shapes.
Coarse grade—Tamping linings.
Coarse grade—Tamping burner blocks.

Norton Crystolon Cements

Crystolon Cement is composed of silicon carbide mixed with a suitable proportion of ceramic bond. Crystolon Cement mixtures are designated as RC-1130, RC-1131, etc., denoting Refractory Crystolon.

These mixtures provide an "acid" lining. They are not recommended for use in contact with wire resistors but are used successfully in furnaces heated by an electric arc or a carbonaceous fuel.

CRYSTOLON Cements (silicon carbide) are put to the following typical uses:

Fine grade—Muffle patching.
Fine grade—Painting furnace lining walls.
Coarse grade—Tamping linings and shapes.

Norton Magnesia Cements

The essential elements of Norton Magnesia Cements are electrically fused magnesia and the bonding material. Norton Magnesia Cements provide basic linings for ovens, cupels and furnaces. The electrical properties of fused magnesia make these cements valuable as electrical insulating mediums, particularly in the high temperature range. These magnesia cements are designated by the letters "RM" as "RM-1005," etc. RM denotes Refractory Magnesia.

MAGNESIA Cements are put to the following typical uses:

Coarse grade—Tamping linings for copper and high copper alloys.
Coarse grade—Crucible lining in manganese steel melting.
Fine grade—Electrical insulator in electrically heated devices.

INSTRUCTIONS FOR USE

Selection

The choice of Alundum, Crystolon and Norton Magnesia Cements is dependent upon both mechanical and chemical requirements. Neither Alundum nor Crystolon Cements should be used in contact with molten iron or fused iron salts. Other conditions permitting, a Crystolon Cement should be chosen where rapid temperature changes are to be encountered except with electrical resistors. For use under strongly oxidizing conditions Alundum Cement or Norton Magnesia Cement should be chosen in preference to Crystolon Cement.

Preparation

Mixing for plastic use, add water sparingly, mix thoroughly and apply to moistened surfaces. It is desirable to moisten the surface to which the cement is applied, to prevent the cement from giving up its water too rapidly by absorption.

For tamping, add water sparingly until a sample, after thorough mixing, will hold together when firmly compressed in the hand. No free moisture should be evident. It is important to riddle or screen the dampened mixture before using and prevent undue drying by covering with damp cloths.

To use in "slip" form, add water in greater amounts to obtain a creamy consistency.

Application

The finer grained mixtures (see table next page) shrink more than coarser ones from the plastic mix to the dry state.

Minimum shrinkage follows use of smallest water content in mixing.

Plastic mixtures should be applied to moistened surfaces; slicking or smoothing the surface with a trowel is considered good practice for either type of mixture.

Tamping mixtures should be roughened between two successive layers, in order to eliminate seams or joints.

Firing

Great care should be taken to dry all cement mixtures thoroughly before firing. In some cases air drying will be sufficient but frequently very careful application of artificial heat is necessary.

Special Instructions

Unused, dried out material can be pulverized and remixed with water without any loss of refractory value. In reclaiming such mixtures care should be exercised to prevent separation of refractory and bond. This is done by mixing the dry grains thoroughly.

Blends of two or more cements often fulfill special requirements for peculiar shapes, physical needs and so forth.

Alundum Cements have wide application in all types of electrically heated equipment of the wire resistor type. They are very refractory and have high electrical insulation value; are easy to apply and economical to use.

Norton Refractory Cements

(Figures indicate approximate hardening temperatures)
Maturing temperature is the point at which sintering takes place

For Plastic Mixtures	For Ramming or Tamping
RA-162 fine { 1000° C. / 1830° F. Base metal resistor imbedding RA-1019 { 1000° C. / 1830° F. Brick setting RA-355 extra fine { 1000° C. / 1830° F. Resistor imbedding	RA-889 { 1000° C. / 1830° F. Burner block tamping cement RC-1132 medium fine { 1000° C. / 1830° F. (Minimum Maturing Temperature) Monolithic linings Patching
RC-1130 fine { 1000° C. / 1830° F. (Minimum Maturing Temperature) Pit furnace linings Crucible furnace linings Laying up SiC bricks	RC-1131 coarse { 1000° C. / 1830° F. (Minimum Maturing Temperature) Pit furnace linings Crucible furnace linings Monolithic linings Tamping
RM-992 fine { 1320° C. / 2400° F. Lead cupels	RM-868 { 1200° C. / 2190° F. Crucible linings
RA-1055 / RA-305 { low maturing } 600° C. / 700° C. / 1290° F. For installation, where only low temperatures are available	RM 1005 / RM 1085 / RM 1140 / RM 1153 } 1200°C / 2190°F Electric furnace linings in ferrous and non-ferrous melting.
RA-562 fine { 1000° C. / 1830° F. For imbedding platinum resistors RA-563 coarse { 1000° C. / 1830° F.	RA-518 high maturing { 1375° C. / 2500° F. Carbon and metal resistors Will withstand temperatures up to 1800° C.-3270° F.

Characteristics and Uses of Different Types of Norton Refractory Cements

RA 162

This is the most universally used mixture for electrically heated appliances such as flatirons and waffle irons, muffle and tube furnaces, etc. To apply, mix thoroughly with enough water to bring the mass to the consistency of thick mud, or in special work, to the consistency of well tempered moulding sand. It should then be trowelled or tamped in place, allowed to dry thoroughly, and finally heated to the maturing temperature, about 1000° C. This cement is also recommended as a laying mixture for Alundum and Crystolon Bricks and Muffle Plates. Thin joints and a surface wash of the water mix is recommended for brick construction. Approximately one half pound of cement should be provided for each 9″ standard brick.

RA 1019

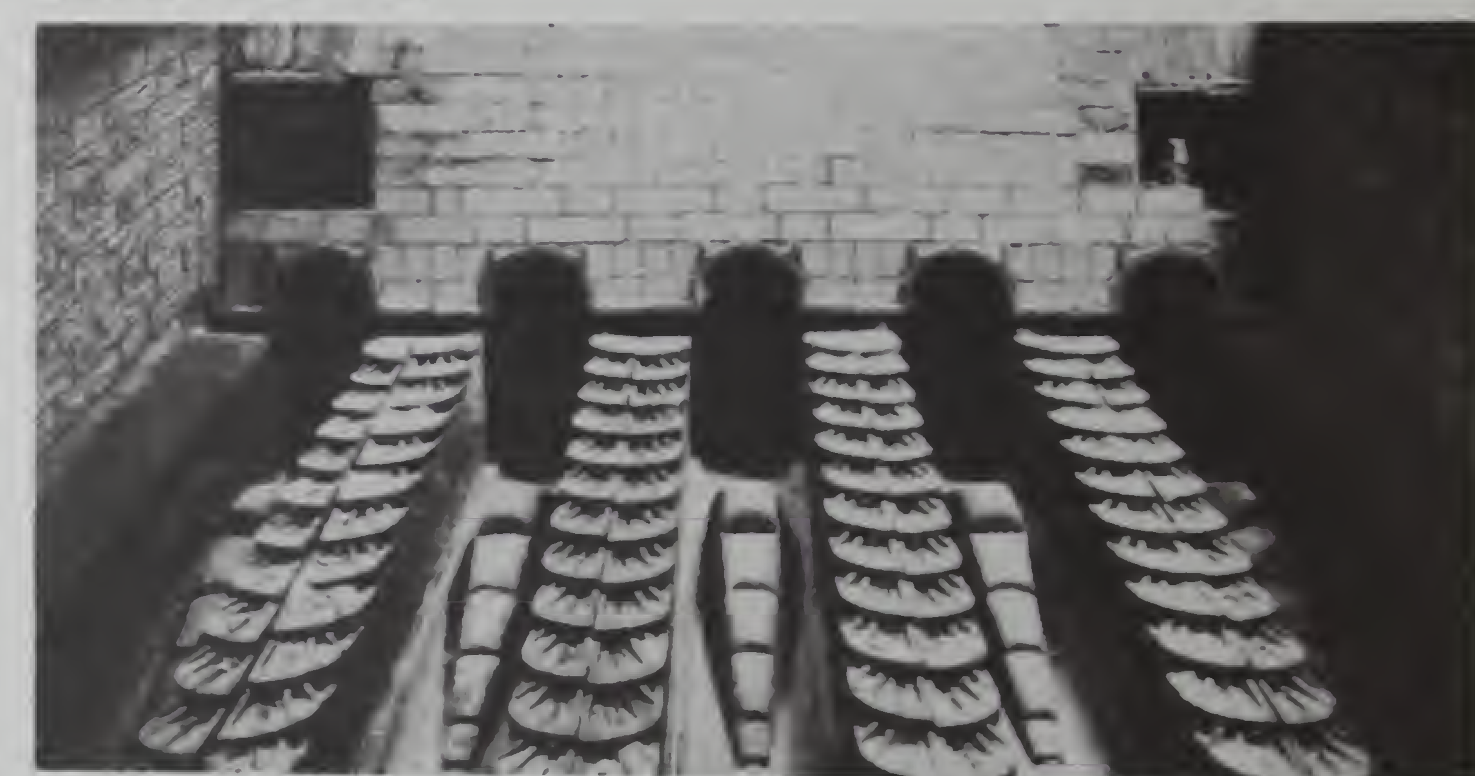
This cement is recommended as a laying mixture for Alundum and Crystolon Bricks and Muffle Plates. Thin joints and a surface wash of the water mix is recommended for brick construction. Approximately one half pound of cement should be provided for each 9″ standard brick.

RA 355

This mixture is a little finer than RA 162 and is found desirable when a finer texture is wanted. In other respects it has substantially the properties of RA 162.

RA 1055

This cement is designed to combine the requirements of electrical insulation and heat transmission with a low maturing temperature. It hardens at about 600° C.



Either Alundum or Crystolon Cement is essential for brick setting in heavy duty installations in stoker fired furnaces.

RA 305

This is a special low maturing fine grain cement that becomes appreciably hard at 700 degrees Centigrade, and is often used alone or blended with other mixtures, such as those mentioned above.

RA 518

This mixture is often used as high as 1800 degrees Centigrade in carbon resistor furnaces. It does not react with carbon at this temperature. It is also found to be very satisfactory for imbedding metallic resistors used at very high temperatures. A little more friable cement is made by using fine Norton fused magnesia and cement RA 518. An expensive metal resistor unit may thus be recovered more easily.

RA 562 AND RA 563

These are very pure mixtures respectively fine and coarse grain, for use with platinum resistance electric furnaces. The resistor is unaffected even at the high temperatures. Generally used in constructing high temperature dental muffles, and cauterizing instruments.

RA 889

This cement is similar to RA 162 but considerably coarser and is used in rammed or tamped linings. It was developed primarily for rammed burner tunnels.

RM 992

This is a relatively fine grained mixture which can be used in a plastic or tamping consistency. It was designed for gold refiners for forming bottoms in cupelling furnaces where it is usually rammed into place to make a dense body. Thorough maturing before use is advised. This cement is also used to embed resistors in electric heating units.

RM 868

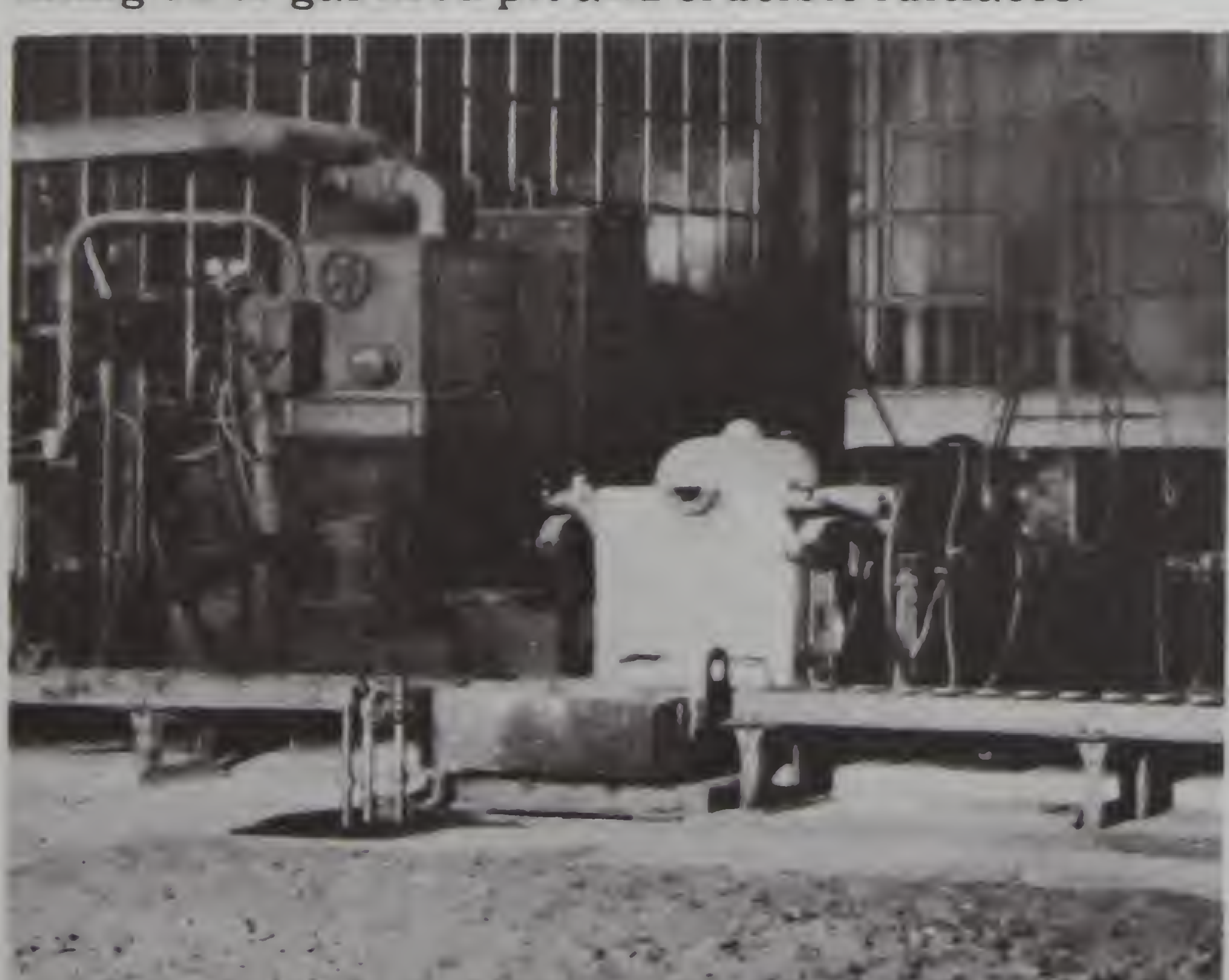
This mixture is coarser than RM 992 and is recommended as a tamping material for lining graphite clay and bauxite crucibles such as used in high frequency electric furnaces. For this operation it is not necessary to prefire the formed shape.

RM 1005, RM 1085, RM 1140, RM 1153

These mixtures were developed for tamped-in linings in electric furnaces of both the induction and arc type. They are chosen for metallurgical reasons and provide linings suitable for both ferrous and non-ferrous melting furnaces. They are widely used in melting copper or high copper alloys.

RC 1130

This is a Crystolon Cement of fine grain. Its application is varied, but it is particularly designed for setting silicon carbide brick. Can be used for lining oil or gas fired pit and crucible furnaces.



Batteries of Furnaces like lined with Magnesia Cements are widely used in the steel industry.

Ceramic Kilns and Furnaces give better returns when the super-refractories are built in with Alundum Cement.

RC 1131

This cement is coarser than RC 1130 and can be used for tamped or rammed linings.

RC 1132

This mixture is coarser than RC 1130 and finer than RC 1131. It is used for tamping and also for patching and for repairing furnace walls. It is highly suitable for monolithic linings.

RC 1133

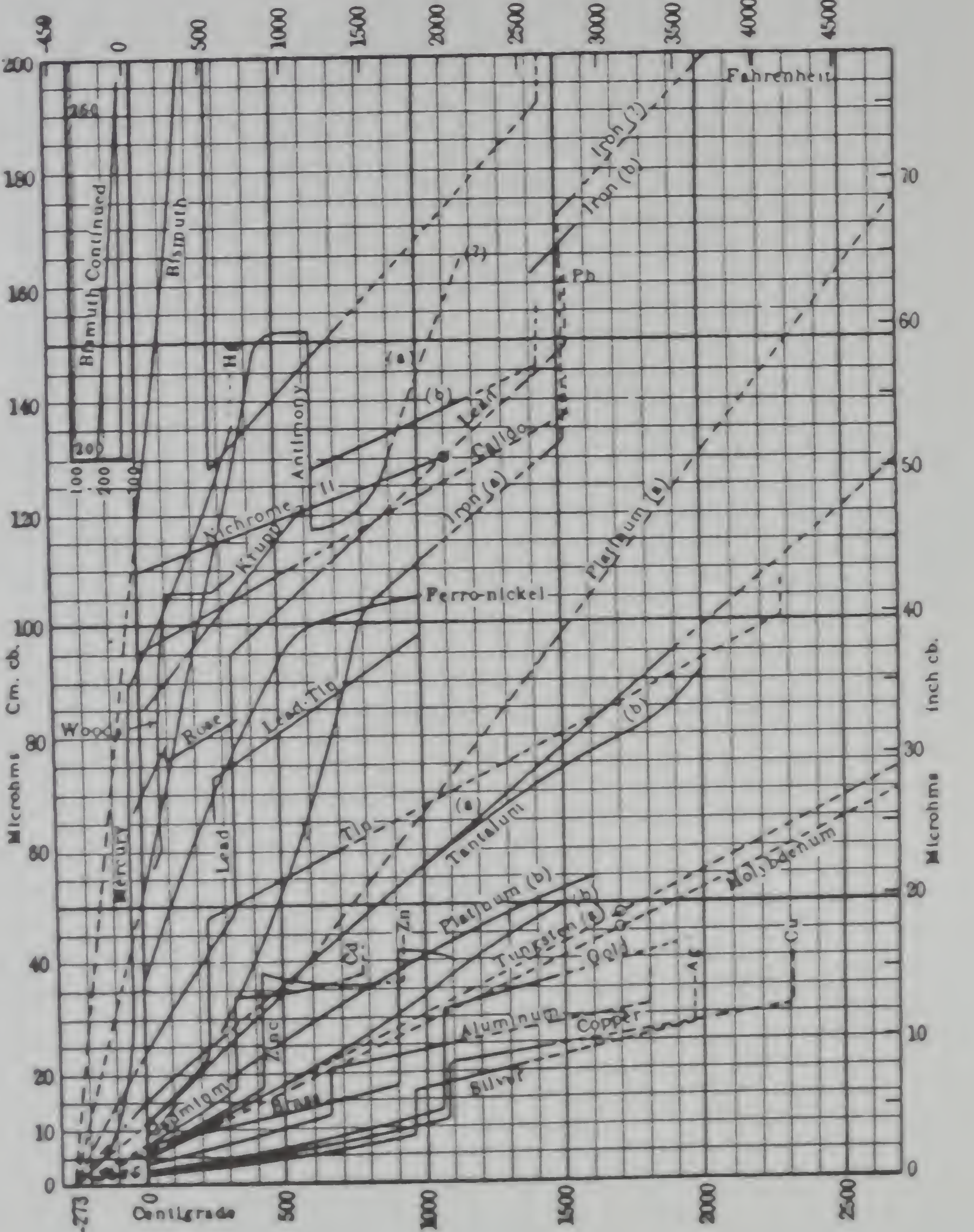
This Crystolon cement is used to ram in walls of pit furnaces, hand-fired boiler furnaces or similar applications where an economical silicon carbide cement is indicated. The silicon carbide content of this cement is somewhat lower than the other Crystolon cements but its refractory qualities are very high. It is shipped only in 100 lb. bags and is priced as follows:

Less than tons	$.05\frac{3}{4}$ per lb.
Tons to carloads.	$.04\frac{3}{4}$ per lb.
Carloads	$.04\frac{1}{2}$ per lb.

Prices Per Pound

Quantity	RA 889 RA 1019 RA 1055 RA 162	RM 1140 RM 1153 RM 868 RM 992 RM 1005 RM 1085	RC 1130 RC 1131 RC 1132	RA 355	RA 305 RA 518 RA 562 RA 563
5 lb. bag	$.25	$.25	$.25	$.30	$.40
10 lb. bag	.18	.22	.18	.27	.38
25 lb. keg	.16	.20	.16	.25	.35
50 lb. keg	.12	.18	.14	.22	.30
300 lb. keg	.10	.14	.12	.18	.25
1,000 lbs.	.10	.12	.12	.18	.20

Comparisons of Electrical Resistivities at High Temperatures*



*Hering, Met. and Chem. Eng., V 1. XIII, p. 24.

Melting Points of the Elements*

Element	°C.	Remarks
†Aluminum	658.7	Most samples give 657 or less (Burgess)
†Antimony	630	"Kahlbaum" purity
Argon	—188	Ramsay-Travers
Arsenic	850?	
Barium	850	(Guntz)
Beryllium	1280	
Bismuth	271	Adjusted
Boron	> 2200 < 2500	
Bromine	—7.3	
Cadmium	320.9-321	Range: 320.7-320.9
Cæsium	26	Range: 26.37-25.3
Calcium	810-805	Adjusted
Chlorine	—101.5—102	(Olszewski)
Carbon	(> 3500)	Sublimes
Cerium	640-645	
Chromium	1650	Burgess-Waltenberg
Cobalt	1480-1478	Burgess-Waltenberg
†Copper	1083 ± 3	Mean. Holbornday. Day-Clement
Erbium		
Fluorine	—223	(Moissan-Dewar)
Gallium	30.1	
Germanium	958	
†Gold	1063	Adjusted
Helium	—271	
Hydrogen	—259	
Indium	155	(Thiel)
Iodine	113.5	Range: 112-115
Iridium	2350?	
†Iron	1530	Burgess-Waltenberg
Krypton	—169	(Ramsay)
Lanthanum	810?	(Muthmann-Weiss)
†Lead	327 ± 0.5	
Lithium	186	(Kahlbaum)
Magnesium	651	(Grube) in clay crucibles, 635
Manganese	1260	Burgess-Waltenberg
Mercury	—38.87	
Molybdenum	2535	Mendenhall-Forsythe
Neodymium	840	(Muthmann-Weiss)
Neon	—253?	
†Nickel	1452	Day, Sosman, Burgess, Waltenberg
Niobium	1700?	
Nitrogen	—211	(Fisher-Alt)
Osmium	About 2700	(Waidner-Burgess, unpublished)
Oxygen	—218	
†Palladium	1549 ± 5	(Waidner, Burgess,-Nernst-Wartenburg, Day, and Sosman)
Phosphorus	44.2	
†Platinum	1755 ± 5	See Note
Potassium	62.3	
Praseodymium	940	(Muthmann-Weiss)
Radium	700	
Rhodium	1950	(Mendenhall-Ingersoll)
Rubidium	38	
Ruthenium	2450?	
Samarium	1300-1400	(Muthmann-Weiss)
Scandium		
Selenium	217-220	
Silicon	1420	Adjusted
†Silver	960.5	Adjusted
Sodium	97.5	
Strontium		Between Ca and Ba?
Sulphur	112.8-119.2	Various forms, see Landolt-Bornstein
Tantalum	2900	Adjusted from Waidner-Burgess—2910
Tellurium	452	Adjusted
Thallium	302	
Thorium	> 1700 < Mo	v. Wartenburg
†Tin	231.9 ± .2	
Titanium	1795	Burgess-Waltenberg
Tungsten	3400	Adjusted
Uranium	< 1850	Moissan
Vanadium	1720	Burgess-Waltenberg
Xenon	—140	Ramsay
†Zinc	419.4	
Zirconium	1700? > Si	Troost

*Smithsonian Physical Tables, Revised Edition, 1921 Reprint.
†Often used as standards in pyrometry.

†Often used as standards in pyrometry.

Comparative Temperatures

Melting Points and Various Other Temperatures	Degrees Centigrade	Degrees Fahrenheit
Ice	0.0	32.0
Tempering (Usual)	200— 300	382— 572
Red Heat (First visible)	475	887
Dull Red Heat	550— [illegible]25	1022—1157
Rolling Steel (Finishing)	700—1050	1292—1922
Annealing and Hardening Carbon Steel	750— 925	1382—1697
Full Cherry Heat	700	1292
Light Red Heat	850	1562
Brass	910— 925	1670—1697
Zinc Bronze	995—1015	1833—1859
Full Yellow Heat	950—1000	1742—1832
Light " "	1050	1922
Cast Iron	1075—1275	1967—2327
White Heat	1150	2108

Melting Points and Various Other Temperatures	Degrees Centigrade	Degrees Fahrenheit
Steel	1350—1525	2482—2777
Open Hearth Furnace	1550—1650	2822—3182
Bessemer Converter	1550—1650	2822—3182
Blast Furnace (Hot part)	1600—1800	2912—3272
Kaolin Brick	1740	3164
Pure Silica Brick	*1750	3182
Bauxite Clay Brick	1795	3263
Chromium Oxide (Cr_2O_3)	1990	3614
Aluminum Oxide (Alundum)	2050	3722
Chromite Brick	2180	3956
Calcium Oxide	2572	4661.6
Magnesium Oxide (Magnesia)	2800	5072
Carbon Arc	*3500	6330
Carbon	*3600	6500
Sun	*6000	10830

Melting points Circular 35, 2nd Ed.; Reprint, 212.
Technologic Papers 10, 17. Bur. of Standards.
Howe's Color Scale—Sci. Paper 11, Bur. of Standards.
*Approximately.

Conversion Factors

Millimeters × .03937 = inches.
Millimeters ÷ 25.4 = inches.
Centimeters × .393 = inches.
Centimeters ÷ 2.54 = inches.
Meters × 39.37 = inches. (Act. Cong.)
Meters × 3.28 = feet.
Meters × 1.094 = yards.
Kilometers × .621 = miles.
Kilometers ÷ 1.6093 = miles.
Kilometers × 3280.7 = feet.
Sq. m. m. × .055 = sq. in.
Sq. m. m. ÷ 645 = sq. in.
Sq. c. m. × .155 = sq. in.
Sq. c. m. ÷ 6.45 = sq. in.
Sq. meters × 10.764 = sq. ft.
Sq. k. m. × 247.1 = acres.
Hectars × 2.47 = acres.
Cu. cm. ÷ 16.387 = cu. in.
Cu. cm ÷ 3.69 = fl. drs (U. S. P.)
Cu. cm. ÷ 29.57 = fl. ozs. (U. S. P.)
Cu. meters × 35.314 = cu. ft.
Cu meters × 1.308 = cu. yds.
Cu. meters × 264.2 = gallons (231 cu. in.)
Litres × 61.023 = cu. in. (Act. Cong.)
Litres × 33.84 = fl. oz. (U. S. P.)
Litres × 2642 = gals. (231 cu. in.)
Litres ÷ 3.78 = gals. (231 cu. in.)

Litres ÷ 28.317 = cu. ft.
Hectolitres × 3.53 = cu. ft.
Hectolitres × 2.84 = bu. (2150.42 cu. in.)
Hectolitres × .131 = cu. yds.
Hectolitres ÷ 26.42 = gals. (231 cu. in.)
Grammes × 15.432 = grains. (Act. Cong.)
Grammes ÷ 981 = dynes.
Grammes (water) ÷ 29.57 = fl. oz.
Grammes ÷ 28.35 = oz. Av
Grammes per cu. cent. ÷ 27.7 = lbs. per cu. in.
Joule × .7373 = ft. lbs.
Kilo. grs. × 2.2046 = lbs.
Kilo. grs. × 35.3 = oz. Av.
Kilo. grs. ÷ 1102.3 = tons. (2000 lbs.)
Kilo. grs. per sq. cent. × 14.223 = lbs. per sq. in.
Kilo. gr. meters × 7.233 = ft. lbs.
Kilo. per meter × .672 = lbs. per sq. ft.
Kilo. per cu. meter × .026 = lbs. per cu. ft.
Kilo. per Cheval × 2.235 = lbs. per H. P.
K. W. × 1.35 = H. P.
Watts ÷ 746 = H. P.
Watts ÷ 737 = ft. lbs. per sec.
Calorie × 3.968 = B. T. U.
Cheval vapeur × 98.3 = H. P.

*International Atomic Weights

	Symbol	Atomic Weight		Symbol	Atomic Weight
Aluminum	Al	26.96	Chromium	Cr	52.01
Antimony	Sb	121.77	Cobalt	Co	58.97
Argon	A	39.91	Columbium	Cb	93.1
Arsenic	As	74.96	Copper	Cu	63.57
Barium	Ba	137.37	Dysprosium	Dy	162.52
Bismuth	Bi	209.0	Erbium	Er	167.7
Boron	B	10.82	Europium	Eu	152.0
Bromine	Br	79.916	Fluorine	F	19.0
Cadmium	Cd	112.41	Gadolinium	Gd	157.26
Calcium	Ca	40.07	Gallium	Ga	69.72
Carbon	C	12.00	Germanium	Ge	72.38
Cerium	Ce	140.25	Glucinum	Gl	9.02
Cesium	Cs	132.81	Gold	Au	197.2
Chlorine	Cl	35.458	Helium	He	4.00

	Symbol	Atomic Weight		Symbol	Atomic Weight
Holmium	Ho	163.4	Rhodium	Rh	102.91
Hydrogen	H	1.0077	Rubidium	Rb	85.44
Indium	In	114.8	Ruthenium	Ru	101.7
Iodine	I	126.932	Samarium	Sa	150.43
Iridium	Ir	193.1	Scandium	Sc	45.10
Iron	Fe	55.84	Selenium	Se	79.2
Krypton	Kr	82.9	Silicon	Si	28.06
Lanthanum	La	138.91	Silver	Ag	107.88
Lead	Pb	207.20	Sodium	Na	22.997
Lithium	Li	6.939	Strontium	Sr	87.62
Lutecium	Lu	175.0	Sulphur	S	32.065
Magnesium	Mg	24.32	Tantalum	Ta	181.5
Manganese	Mn	54.93	Tellurium	Te	127.5
Mercury	Hg	200.61	Terbium	Tb	159.2
Molybdenum	Mo	96.0	Thallium	Tl	204.4
Neodymium	Nd	144.27	Thorium	Th	232.15
Neon	Ne	20.2	Thulium	Tm	169.4
Nickel	Ni	58.69	Tin	Sn	118.70
Niton radium emanation	Nt	222.	Titanium	Ti	47.9
			Tungsten	W	184.0
Nitrogen	N	14.008	Uranium	U	238.17
Osmium	Os	190.8	Vanadium	V	50.96
Oxygen	O	16.00	Xenon	Xe	130.2
Palladium	Pd	106.7	Ytterbium (Neoytterbium)	Yb	173.6
Phosphorus	P	31.024			
Platinum	Pt	195.23	Yttrium	Yt	89.0
Potassium	K	39.095	Zinc	Zn	65.38
Praseodymium	Pr	140.92	Zirconium	Zr	91.
Radium	Ra	225.95			

*Reprinted from International Critical Tables—1926.

End Points of Pyrometric Cones*

(Heated in Air)

Data Adopted by ASTM for Standard Pyrometric Cone Equivalent Test

Seger Cone No.	Degree Centigrade	Degree Fahrenheit	Seger Cone No.	Degree Centigrade	Degree Fahrenheit
022	585	1085	9	1285	2345
021	615	1139	10	1305	2381
020	650	1202	11	1325	2417
019	660	1220	12	1335	2435
018	720	1328	13	1350	2462
017	770	1418	14	1400	2552
016	795	1463	15	1435	2615
015	805	1481	1o	1465	2669
014	830	1526	17	1475	2687
013	860	1580	18	1490	2714
012	875	1607	19	1520	2768
011	905	1661	20	1530	2786
010	895	1643	23	1580	2876
09	930	1706	26	1595	2903
08	950	1742	27	1605	2921
07	990	1814	28	1615	2939
06	1015	1859	29	1640	2984
05	1040	1904	30	1650	3002
04	1060	1940	31	1680	3056
03	1115	2039	32	1700	3092
02	1125	2057	33	1745	3173
01	1145	2093	34	1760	3200
1	1160	2120	35	1785	3245
2	1165	2129	36	1810	3290
3	1170	2138	37	1820	3308
4	1190	2174	38	1835	3335
5	1205	2201	39	1865	3389
6	1230	2246	40	1885	3425
7	1250	2282	41	1970	3578
8	1260	2300	42	2015	3659

Note: Cones 022 to 23 are heated at 150° C. per hour. Cones 23 to 39 are heated at 100° C. per hour and Cones 39 to 42 inclusive at 600° C. per hour in an Arsem furnace. If these rates of heating are not adhered to conversions will not be accurate.

*From "Characteristics of Pyrometric Cones" by Fairchilds and Peters Jour. of Am. Cer. Soc., Vol. 9, No. 11, November 1926, p. 711.

Centigrade to Fahrenheit (°C. x 1.8) + 32.
Fahrenheit to Centigrade (°F.—32) ÷ 1.8.

NORTON PRODUCTS

Abrasives

- Abrasive Grain for:
  - Polishing
  - Lapping
  - Paper and Cloth Manufacture
  - Glass Grinding
  - Pressure Blasting
- Levigated Alumina

Norbide—Norton Boron Carbide, the hardest material ever made commercially by man. Uses:
- (a) An extremely hard abrasive
- (b) Metallurgical compound
- (c) Molded products

Bonded Abrasives

- Grinding Wheels
- Bricks, Sticks, Blocks and Segments
- Cylinder Hones
- Sharpening Stones
- Mounted Wheels and Points

Pulpstones

- for Pocket, Magazines and Continuous Grinders

Refractories and Porous Mediums

- Raw Refractory Materials
- Electrically Fused Magnesia
- Laboratory Ware
- RR Alundum Grain
- Cements
- Kiln Furniture
- Furnace Linings
- Bricks, Blocks and Plates

- Porous Plates, Tubes and Diaphragms

Machinery

- Universal Tool and Cutter Grinding Machines
- Precision Grinding and Lapping Machinery
- Dynamic Balance Indicating Machines

Norton Floors

- Alundum Floor and Stair Tile, Ceramic Mosaic Tile, and Aggregates

BEHR-MANNING PRODUCTS

Abrasive Papers and Cloths in Sheets, Rolls, Discs and Belts

Mineral Coatings

- Natural Abrasives: Garnet, Flint, Emery
- Artificial Abrasives—Aluminum Oxide, trade-marked: Adalox—Durundum—Metalite
- Silicon Carbide, trade-marked: Durite—Speed-grits—Speed-wet (waterproof)
- Pouncing Paper
- Buffem Paper

Gasket Material

Life Guard Cushion Rug Holder

Oilstones and Abrasive Specialties

- India Oilstones
- Crystolon Oilstones
- Arkansas Oilstones
- Washita Oilstones
- Artificial and Natural Scythestones and Axe Stones
- Grinding Wheels for Hardware and Automotive Repair Trades
- Multi-Oilstone
- General Purpose Stones
- Hand Tool Grinders
- Red Head Utility File
- Shoemaker's Stones
- Razor Hones

NORTON
REFRACTORIES

NORTON COMPANY, Worcester, Mass.
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